Watershed: **Kings River**

Years Sampled: **2008, 2010-2014**

Study Objectives:

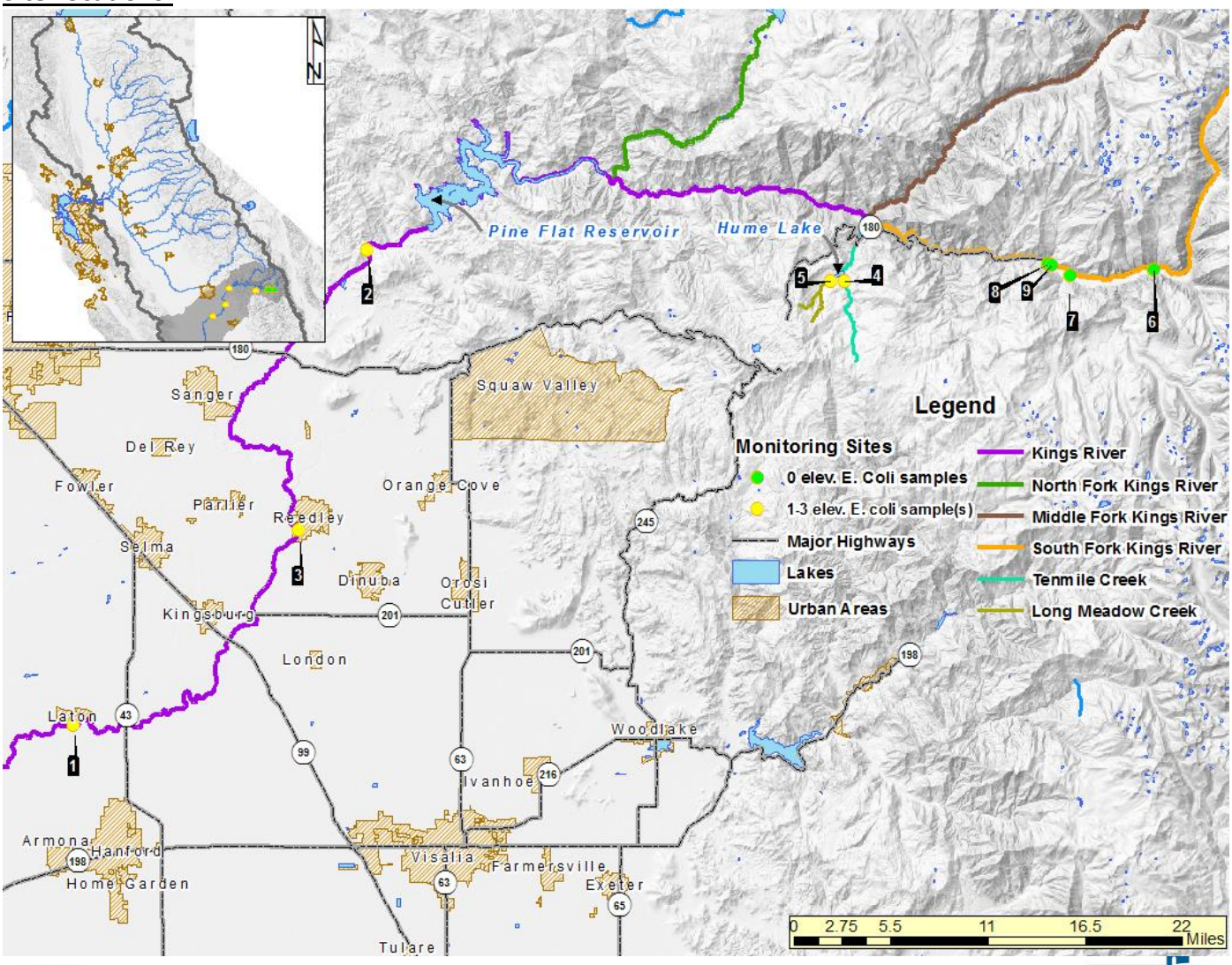
1. Is there any evidence that beneficial uses are being impacted, and if so, what are potential contributors?
2. Are there any noticeable regional, seasonal or trends observed in the water quality data?
3. What are pathogen concentrations at selected monitoring sites?

KEY STATISTICS

Number of sites sampled	**9**
Sampled by	**Water Board Staff (Fresno)**
Number of sites sampled for pathogens	**3**
Number of total samples	**317**
Sampling Frequency	**2x/mo. (May-Sept.)**
Assessment Threshold	**320 MPN/100 mL**

MESSAGE: **Five sites have had one or more samples with elevated *E.coli* and three sites have tested positive for pathogens. Four sites never exceeded the assessment threshold.**

Site Locations:



Summary of Results:

Table 1: Field Measurements

Station Code	Map #	Station Name	Oxygen, Dissolved (mg/L)		pH		SpConductivity (uS/cm)		Temperatiure (˚C)		Turbidity (NTU)	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
551KIN060	1	Kings River at Laton-Kingston Park	3.93	10.98	6.24	7.98	20.1	84.9	12.00	24.70	1.10	4.06
552FRE510	2	Kings River at Winton Park	0.37	11.79	5.58	8.03	15.8	45.1	2.27	22.00	0.34	4.72
552FRE511	3	Kings River at Reedley Beach	0.42	16.80	5.72	8.25	19.6	125.3	10.30	23.11	0.82	4.63
552HUM020	4	Hume Lake at Tenmile Creek	3.37	10.50	6.52	9.34	33.4	68.2	9.20	25.50	1.04	5.76
552HUM030	5	Hume Lake at Long Meadow Creek	0.11	11.63	6.24	8.07	32.1	205.5	4.40	24.40	1.05	188.00
552KIN900	6	Kings River, S Fork at Muir Rock	4.24	12.52	6.11	8.11	13.0	55.0	4.70	15.70	0.12	3.51
552KIN901	7	Kings River, S Fork at Hotel Creek and Cedar Grove	3.99	12.21	4.60	7.84	13.1	53.8	5.10	18.00	0.12	4.11
552KIN902	8	Kings River, S Fork at Lewis Creek Trailhead	4.31	12.23	6.32	7.78	13.5	56.1	5.30	19.10	0.16	5.49
552KIN903	9	Kings River, S Fork at HWY-180 & Cedar Grove	4.20	12.45	6.32	7.84	4.3	55.0	5.00	20.10	0.14	4.57

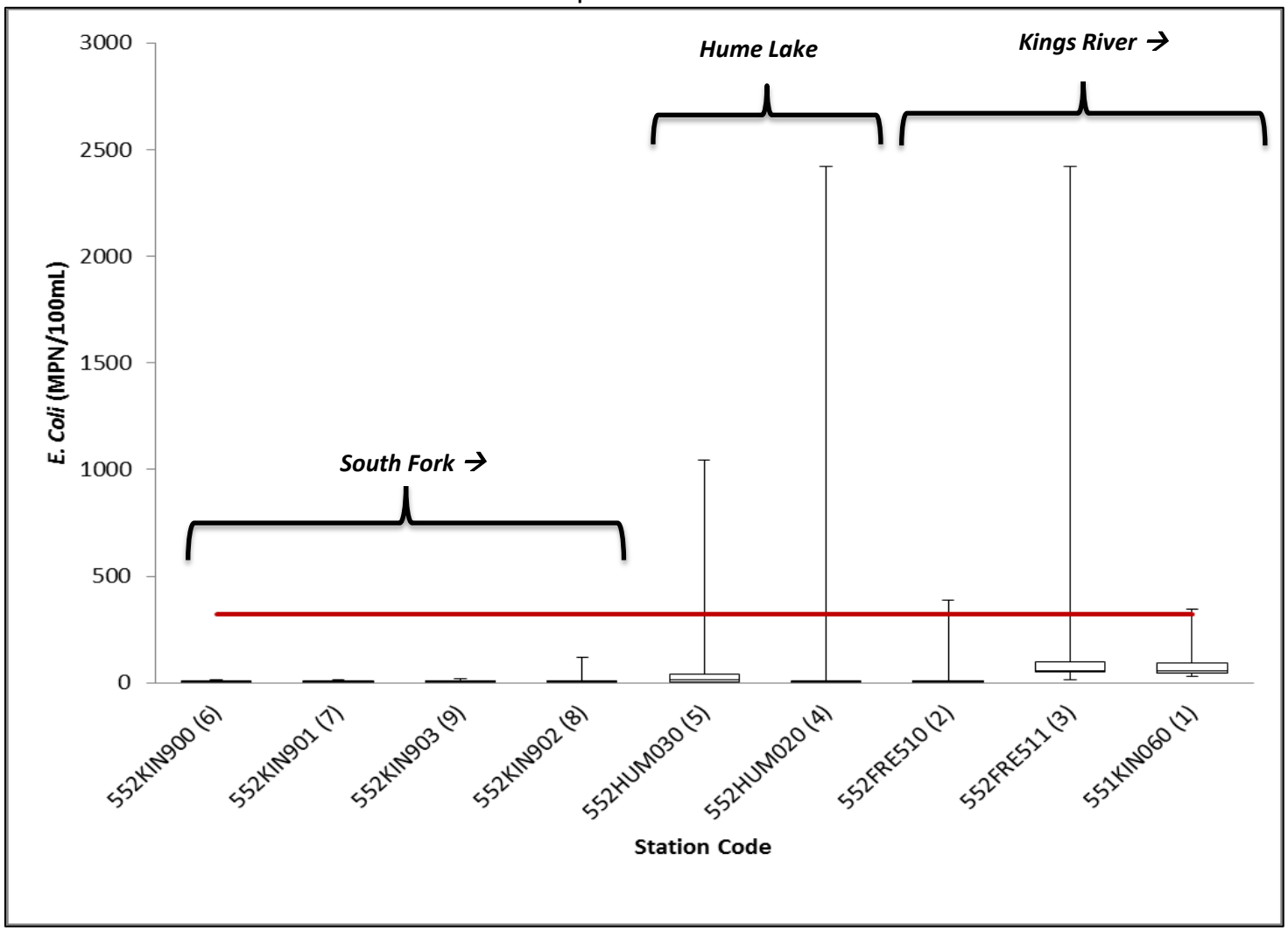
Table 2: *E. coli* and Pathogen Results

Map #	*E. coli* (MPN/100ml)					*Cryptosporidium* (cysts/L)			*Giardia* (oocysts/L)			*Salmonella* (MPN/100mL)			*E.Coli* O157:H7 (Presence/Absence)		
	Mean	Min	Max	Count	>320	Max Result	Count	(+)	Max Result	Count	(+)	Max Result	Count	(+)	Result	Count	(+)
1	90.7	32.7	344.8	21	1	0.1	5	1	0.7	5	2	0.5	4	4	Not Detected	4	0
2	27.9	<1.0	387.7	28	1	0.4	8	4	0.1	8	1	0.1	7	3	Not Detected	7	0
3	187.3	14.6	2419.6	27	3	0.3	7	4	0.2	7	1	0.6	6	6	Not Detected	6	0
4	96.6	<1.0	2419.6	28	1	NA	0	0	NA	0	0	NA	0	0	NA	0	0
5	95.9	<1.0	1045.2	28	2	NA	0	0	NA	0	0	NA	0	0	NA	0	0
6	4.2	<1.0	12.1	28	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
7	3.9	<1.0	14.6	27	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
8	8.4	<1.0	118.7	28	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
9	5.3	1.0	19.7	28	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0

E.coli - Highlighted Cells: Exceeds EPA Guidline of 320 MPN/100ml

Pathogens - (+): positive result, Highlighted Cells: positive results, NA: Not Applicable

Graph 1: *E Coli* Results



6,7,9,8 = progressive DS flow along South Fork; 5,4 = Long Meadow Creek (5) and Tenmile Creek (4) confluences with Hume Lake; 2,3,1 = progressive DS flow along Kings River (below Pine Flat Reservoir)

WHAT IS THE MEASURE SHOWING?

The Kings River originates from the Serra Nevada and Central Valley, distributing itself upon an alluvial fan at the valley floor; from there, channels may either join with the northern San Joaquin River, or continue south into the Tulare Lake Basin. Just beyond its North, Middle, and South Forks, water from the Kings River is impounded at Pine Flat Reservoir, where it is channeled for irrigation and groundwater recharge. Tenmile and Long Meadow Creek are tributaries that feed into Hume Lake, and eventually the South Fork. Field measurements for each site are shown in Table 1.

Results show that five sites exhibited elevated levels of *E. coli* in the Kings watershed on one or more occasions (shown in Table 2). These sites are located south of Pine Flat Reservoir (1,2,3) and at both of the Hume Lake sites (4,5). There were 8 samples with elevated levels out of 243 samples, or 3.3%. The highest concentrations (>2419.6MPN/100 mL) occurred at Hume Lake near Tenmile Creek (4) and at Reedley Beach (3) along Kings River. While there were detections at five sites (shown in Graph 1), their occurrences were few relative to the sample count. There were no detections along the South Fork.

The watershed is primarily cropland (Jin et al., 2013), and potential non-point and urban sources are abundant. Parts of the watershed are heavily utilized for recreational activities, and it is also home to numerous waterfowl and other wildlife.

Three sites in the Kings River watershed were sampled for pathogenic *E. coli* O157:H7, *Cryptosporidium*, *Giardia*, and *Salmonella*. All three of the sites tested positive for pathogens (shown in Table 2). There are currently no water quality objectives for these constituents.

WHY THIS INFORMATION IS IMPORTANT?

In 2012, the USEPA amended recreational water quality guidelines for human health under the Clean Water Act, specifying the standard threshold value (STV) for the indicator bacteria *E. coli* as 320 colony-forming units (CFU) per 100 milliliters (mL). The STV represents the 90% percentile of the water quality distribution, beyond which the water body is not recommended for recreation (Nappier & Tracy, 2012).

E. coli is an indicator of potential fecal contamination and risk of illness for those exposed to water (e.g. when swimming). Since *E. coli* is only an indicator of potential pathogens and does not necessarily identify an immediate health concern, the data collected from this study provide more information on pathogen indicators as well as specific water-borne pathogen concentrations to better assess their impact on the beneficial use of recreation and to identify potential contributors by sub watershed.

WHAT FACTORS INFLUENCE THE MEASURE?

E. coli and specific water-borne pathogens can come from human or animal waste and may be highly mobile and variable in flowing streams. In addition to human recreational use, the presence of pathogens in water may be the result of cattle grazing, wildlife, urban and agricultural runoff, or sewage spills. The physical condition of the watershed may also influence pathogen measurements, however in this study field measurements (temperature, SC, DO, turbidity and pH) were variable between sites and it is unclear if these constituents had an effect on the *E. coli* or pathogen measurements.

TECHNICAL CONSIDERATIONS:

- Data available at: CEDEN
- *E. coli* is only an indicator of potential pathogens and does not necessarily identify an immediate health concern.
- Public reports and fact sheets are available at: http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_studies/surface_water_ambient_monitoring/swamp_regionwide_activities/index.shtml

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